



UNITED STATES PATENT AND TRADEMARK OFFICE

cen
UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/663,767	09/17/2003	Satoshi Hirayama	03560.003352	3840

5514 7590 12/26/2006
FITZPATRICK CELLA HARPER & SCINTO
30 ROCKEFELLER PLAZA
NEW YORK, NY 10112

EXAMINER

EGAN, SCOTT T

ART UNIT	PAPER NUMBER
----------	--------------

2621

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/26/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/663,767

Applicant(s)

HIRAYAMA ET AL.

Examiner

Scott Egan

Art Unit

2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 9/17/2003 and 10/29/2003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The information disclosure statements (IDS) submitted on September 9th, 2003 and October 29th, 2003 were filed. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Art Unit: 2621

4. **Claim 1 and 3** are rejected under 35 U.S.C. 102(b) as being anticipated by **Shigeta et al. (US 5,976,907)**.

Consider **claim 1**, Shigeta et al. explicitly teach "A solid-state image pickup device solid state imaging device, Fig 6) comprising:

a photoelectric conversion portion (photodiodes 12, Fig 6) for generating signal electric charges in accordance with an amount of incident light (12 denotes photodiodes formed as light receiving portions on the surface of the semiconductor substrate 11 so as to convert incident light into a charge, column 4 lines 27-30);

a plurality of color filters (color filter 14, different color filters are shown by different patterns in Fig 6);

and a flattening layer (second flattening layer 14) formed on said plurality of color filters (Fig 6), wherein a thickness of a projection or a recess on a surface of said flattening layer, provided on a region where color filters are adjacent to each other, is equal to or less than $0.2\ \mu\text{m}$ (15 denotes a second flattening layer for flattening the level difference on the surface of the color filter 14, column 7 lines 63-65)."

Consider **claim 3**, Shigeta et al. explicitly teach "A solid-state image pickup device according to Claim 1, wherein said plurality of color filters are formed according to divided exposure (each color filter 14 corresponds to a color filter 14 and a microlens 50 as seen in Fig 6) in which said solid-state image pickup device is divided into a plurality of exposure regions (the solid state image device shown in Fig 6, is divided into a plurality of exposure regions by each photodiode collected light from and turning the light into electric charge, this can be seen by each lens being positioned in accordance

Art Unit: 2621

with the photodiodes, column 4 lines 46-48, column 5 lines 16-18), and a desired pattern is formed by combining patterns of the divided exposure regions (when the charge is (the light collected from each photodiode is combined to create the overall image, column 4 lines 27-30)."

5. **Claims 4, 5, 7 and 9** are rejected under 35 U.S.C. 102(e) as being anticipated by **Lee (US 6,407,415)**.

Consider **claim 4**, Lee explicitly teaches "a solid-state image pickup device (solid state image sensor, Fig 4) comprising:

a photoelectric conversion portion (photodiode region 44, Fig 4) for generating signal electric charges in accordance with an amount of incident light (column 4 lines 56-67 through column 5 lines 1-6);

a plurality of color filters (a color filter layer 51 at each position opposite to each of the photodiode regions 44, column 5 lines 12-15, Fig 4); and

a condenser lens (microlenses made of layer 53 and 54, Fig 4), having a shape to cause the incident light to pass through a region of a color filter having a uniform spectral characteristic (Fig 4), for condensing the incident light onto said photoelectric conversion portion (column 5 lines 38-42)."

Consider **claim 5**, Lee explicitly teaches "a solid-state image pickup device according to Claim 4, wherein said condenser lens has a shape to cause the incident light to pass through a region of a color filter having a uniform thickness (Fig 4 shows the lines that the light passes through the color filter 51, which can be seen as having uniform thickness in the Fig).

Art Unit: 2621

Consider **claim 7**, Lee explicitly teaches "a solid-state image pickup device according to Claim 4, further comprising a wiring layer formed between said photoelectric conversion portion and said plurality of color filters (Fig 4 shows layer between the color filter 51 and photodiode region 44), wherein said wiring layer includes a wiring disposed so as not to cross an outermost optical path of the incident light (column 4 lines 53-67 through column 5 lines 1-6 describe the charge transferring and Fig 4 shows that the regions do not restrict the path of the light depicted by the arrows)."

Consider **claim 9**, Lee explicitly teaches "a solid-state image pickup device according to Claim 4, wherein said plurality of color filters (color filter 51) are formed according to divided exposure (Fig 4) in which said solid-state image pickup device is divided into a plurality of exposure regions (column 5 lines 7-11 demonstrates that the solid state device is made up of different regions corresponding to each photodiode), and a desired pattern is formed by combining patterns of the divided exposure regions (each photodiode collects light of different wavelengths to be put back together column 5 lines 7-11).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2621

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Shigeta et al. (US 5,976,907)** in view of **Chen et al. (US 6,765,277)**.

Consider **claim 2**, Shigeta et al. explicitly teach the solid state image pickup device of claim 1. Shigeta et al. further teach the flattening layer (second flattening layer 14).

However, Shigeta et al. do not explicitly teach that the flattening layer has to have a thickness of at least 1.0 μm .

In the same field of endeavor Chen et al. teach a microelectronic fabrication (Fig 5) which includes photoactive regions 12a-12c as well as microlenses 24a-24c and a spacer layer 22 in between the microlenses and the color filter layer 20 (Fig 5). Chen et al. further teach that the thickness of the spacer layer 2-3 μm (column 8 lines 42-45).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the thickness of the layer found in Chen et al. into the solid state image device found in Shigeta et al. in order to concentrate the incident light upon a corresponding one of the photoactive regions (column 8 lines 21-23) increasing the efficiency of the light collecting process.

Art Unit: 2621

9. **Claim 6** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Lee (US 6,407,415)** in view of **Chen et al. (US 6,765,277)**.

Consider **claim 6**, Lee explicitly teaches the solid stage image pickup device of claim 4 and a microlens that condenses the light onto the color filter. Lee further discloses equations to figure out the focal distance of the light incident on the microlens (column 2 equations).

However, Lee does not explicitly teach dimensions that would result in the light being incident on the color filter in the range of $0.1L - 0.25L$ from the edges of the pixel, where L represents the pixel diameter.

In the same field of endeavor Chen et al. teach a microelectronic fabrication (Fig 5) which includes photoactive regions 12a-12c as well as microlenses 24a-24c and a spacer layer 22 in between the microlenses and the color filter layer 20 (Fig 5). Chen et al. further teach the dimensions of the different regions of the fabrication in column 8 lines 32-48. Using the dimensions in Chen et al. and the equations from Lee it was calculated that the beams would hit the color filter over 66% of the diameter of the pixel. The specific dimensions used were $12\text{ }\mu\text{m}$ for the diameter of the pixel, $3\text{ }\mu\text{m}$ for the thickness of the microlens, and $3\text{ }\mu\text{m}$ for the thickness of the flattening layer.

It would have been obvious to one of ordinary skill at the time the invention was made to use the dimensions found in Chen et al. in the solid state image sensor and equations found in Lee in order to concentrate the incident light upon a corresponding one of the photoactive regions (column 8 lines 21-23) increasing the efficiency of the light collecting process.

Art Unit: 2621

10. **Claim 8** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Lee (US 6,407,415)** in view of **Li (US 6,271,900)**.

Consider claim 8, Lee explicitly teaches the solid stat image pickup device according to claim 4.

However Lee does not explicitly teach that the condenser lens has a function of a color filter.

In the same field of endeavor, Li teaches an integrated microlens and color filter structure (Fig 3). Li further discloses that the microlenses are used as the color filters (column 3 lines 27-33, Fig 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include the microlenses found in Li into the solid state image sensor found in Lee in order to provide a less expensive microlens and color filter system that is easier to fabricate, reduces crosstalk between filters, and provide a device that has less layers to avoid problems with adhesion.

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott Egan whose telephone number is (571) 270-1452. The examiner can normally be reached on Monday-Friday 8:00 a.m. - 5:00 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Edouard can be reached on (571) 270-1455. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2621

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SE



PATRICK N. EDOUARD
SUPERVISORY PATENT EXAMINER